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# NORTH AMERICAN AIR DEFENSE COMMAND

## Weekly Intelligence Review

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# NORAD

Weekly  
Intelligence  
Review

Issue No. 25/64, 19 June 1964

## The WIR in Brief

Portion identified  
as non-responsive  
to the appeal

### Space

#### 4 JUNE LAUNCH FAILS; INSTRUMENTATION SHIP RETURNING TO PORT

Chazhma may have been sent to Pacific to  
participate in event.

#### PREPARATIONS FOR LONG MANNED SPACE FLIGHTS SUGGESTED BY STUDIES OF CLOSED ECOLOGIES

Alga Chlorella (pond scum) receiving emphasis,  
but may have to be supplemented. No progress  
in waste disposal noted.

Portion identified  
as non-responsive  
to the appeal

COVER: Soviet missile shown in 1 May 1964  
parade (OFFICIAL USE ONLY)  
NOTE: Pages 28, 30, 31, 34, 35, 38, and  
39 of this issue are blank.

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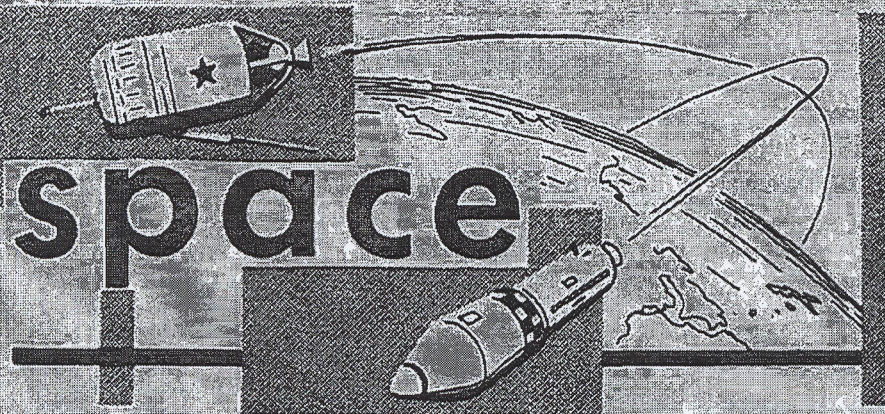
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significant  
intelligence  
on space  
developments  
and trends

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#### 4 June Launch Fails; Instrumentation Ship Returning to Port

The Soviets apparently tried to launch a space vehicle from Tyuratam (TT) at about 0400Z, 4 June, [REDACTED]. The vehicle failed to achieve orbit, however, for it was never detected by SPADATS or associated sensors. Its mission is not presently known.

The Soviet missile-range instrumentation ship Chazhma appears to have been sent to the Pacific to assist in this event. Before the launch, it left its Siberian port and proceeded to mid-Pacific, where it took up a position on the Earth trace for a TT launch and remained there until some time after the launch. The Chazhma has since been observed sailing toward Siberia, apparently returning to its home port.

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#### Preparations for Long Manned Space Flights Suggested by Studies of Closed Ecologies

Based on a CIA analysis.

Two closely related problems of life support confront man in preparing for manned space flight:

- Providing supplies of air, water, and food suitable for human use.
- Disposing of human body wastes -- the products of respiration, perspiration, urination, and defecation.

Three methods are presently known for meeting these requirements:

- A completely expendable system which supplies man's needs from on-board stores of oxygen, water, and food, and makes provision for absorbing carbon dioxide and for storing liquid and solid wastes.

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- A partially regenerative system which recycles air through facilities which absorb carbon dioxide and release oxygen and which distill liquid wastes and release water.
- A completely regenerative system -- known as a closed ecological system -- in which suitable quantities of selected living organisms are carried in the spacecraft. By their own life processes, these organisms absorb human wastes and release oxygen, water, and food for man's needs. Man's wastes support them, and their wastes support man.

The first two systems are satisfactory for manned space flights of relatively short duration, but the weight of the food supplies to be carried increases rapidly with increased flight duration. Eventually, the total weight of these stores causes payload weight to exceed the capabilities of the propulsion system. With closed ecological systems, the initial weight -- comprising the organisms, and the solutions in which they live -- is relatively large, regardless of the duration of the flight; however, this weight increases only negligibly as the duration of flight is lengthened. Thus, completely regenerative systems of biological organisms appear to be the answer to the weight problem for manned space flights of very long duration or in which lengthy habitation on the Moon or other planets is involved.

The problem with closed ecological systems is to identify organisms which can absorb human wastes and, in return, supply human needs for oxygen, water, and food. Such organisms must also be able to withstand the vibration and G-forces of lift-off and to function efficiently under conditions of weightlessness and cosmic radiation and within the restraints of space, weight, temperature, and lighting imposed by the spacecraft environment.

The Soviet Program. Limited Soviet research on the fundamental aspects of the biological requisites of living organisms (including man) within a closed ecological system originated in the 1920s. This fundamental research received increased emphasis in the mid-1950s, and in 1959 a partially closed ecological system which supported 1 man for 7 days was designed and tested. Since then, Soviet biospace research has made rapid progress.

Spokesmen and scientists associated with the Soviet bioastronautic program regard the development of a reliable closed ecological system as the most vital component for prolonged manned space exploration and habitation.

The design, experimentation, and analysis within this Soviet research program are conducted sequentially and systematically. Precise and



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valid research that supports the development of a closed ecological system is assured by the high competence of the contributing scientists. Research facilities are generally adequate, although the development of equipment for intensive algal cultivation is several years behind comparable US equipment.

Soviet efforts closely parallel those of the West. In some areas the Soviets may precede the US, but in others they appear to depend heavily on inputs from Western, Japanese, and Czechoslovak technical literature.

The Soviets have "flight tested," not ecological systems, but various biological specimens, including Chlorella, to determine the effects of space flight on their viability and functional stability during space flight. These were carried aboard Spaceships 2, 4, and 5 (1960 and 1961) and the manned Vostok vehicles Nos. 1-5.

Current research is directed toward obtaining maximum effective use of single-celled protococcaceous aerobic algal strains. Indications are that the alga Chlorella (pond scum) will be selected to meet the requirements of biological gas exchange and to provide the primary source of nutrition. The Soviets, after testing, have indicated that man will not live in space on Chlorella alone, but that supplements will be needed. There is a dearth of details on the management of biological wastes.

#### Prospects.

- The emphasis which Soviet studies of closed ecological systems is receiving indicates that the USSR is planning to undertake, at some unknown future date, manned space missions which will last more than 90 days.
- A prototype model of a closed ecological system could be built now on the basis of present Soviet research results, and a reliable system of this type could be developed prior to 1970.

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